2. Rejection under 35 U.S.C. § 102 (b)/103

Claims 1-11 and 13 are rejected as anticipated by or in the alternative as being obvious over Lattin *et al.* ("Lattin"). The examiner alleges that Lattin discloses treating the same meat product at the same concentrations and that microorganisms known to contaminate foods other than *Salmonella* would have been inherently removed from the meat products.

Applicants respectfully disagree with the examiner's interpretation of Lattin. In regard to the inherency issue, Lattin does not disclose treating meat products to prevent the growth of microorganisms other than *Salmonella* for a contact time of less than 10 minutes as now recited in claim 1. Example 6 of Lattin, disclosing the only experiments showing the effect of quaternary ammonium compounds (QACs) on food products, contact quaternary ammonium compounds with chicken skin for 30 or 60 minutes. Therefore, Lattin does not inherently disclose the claimed method. Likewise, there is no suggestion in Lattin that a shorter contact time of quaternary ammonium compounds with the food product could be used to prevent growth of microorganisms on the surface of the food product; i.e., chicken skin. It is noted that most of the examples in Lattin showing the effectiveness of QACs against *Salmonella*, utilized buccal epithelial cells, which were contacted with QACs for about 10 minute, during which the cells were suspended, vortexed and centrifuged with QACs. Although this contact time was relatively short in duration, this short contact time was not used in the chicken skin experiments of Example 6. There was no suggestion in Lattin to utilize a contact time of less than 10 minutes with QACs to effectively and safely remove contamination from food produced by an foodborne microorganism including *Salmonella*. Therefore, the method of Lattin does not render the claimed method obvious.

Further, it was known in the art that longer exposure times of several disinfectants were required to eliminate bacteria that were harbored on porous surfaces rather than on nonporous surfaces. See page 306, second column of Mustapha *et al.*

publication, (Appendix 1). Mustapha *et al.* discloses that several publications by Stedman *et al.* support that longer exposure times to disinfectants are required to eliminate bacteria harbored on porous surfaces than on nonporous surfaces. Because meat is considered a porous surface, it would be expected that longer contact times with QACs, would be required, such as those disclosed in Lattin. Unexpectedly, the present inventors have determined that in fact, shorter QAC contact times with meat products could be utilized that were as effective than the longer contact times. This shorter contact time with QACs on meat products provides an unexpected advantage for using the claimed method in a commercial environment to disinfect large quantities of food. There is no suggestion in the prior art of this result, and in fact, the prior art suggests the opposite effect; i.e., that longer exposure times would be required to reduce or prevent foodborne microbial contamination on meat products.

The activity of a given antimicrobial agent against a particular microorganism cannot be inferred by its activity against other microorganisms, and this is especially true, when the effectiveness of a particular antimicrobial agent is evaluated on different substrates or surfaces. For example, certain bacteria, when attached to a surface secrete a glycocalyx. It cannot be predicted whether a given biocide will be able to penetrate this barrier, a necessary condition for having an antibacterial effect. Because it is impossible to predict if an antimicrobial agent will be effective on different surfaces, the only way to determine the agent's antimicrobial efficacy on a the surface of a particular food product surface is to perform the experiment under the actual conditions of intended use. Therefore, it is applicant's position that the prior art cited by the examiner does not suggest that QACs would be effective against the disclosed microorganisms on the surface of meat using the recited contact time of the claimed method.

It should be noted that few antimicrobial agents useful in food processing are effective against *E. coli*, and particularly against, *E. coli* O157:H7. The ineffectiveness of organic acids,

such as acetic, lactic and citric acids against *E. coli* O157:H7 was evidenced by the recent outbreak in Washington State of this organism in naturally acidic apple cider.

Additionally, decontamination of meat products containing pathogenic microorganisms using QACs for the disclosed contact times provides a major advantage for the food processing industry. The short contact times allows the food to be processed in an fast, efficient manner without sacrificing the efficacy of the agent in killing, reducing and/or inhibiting attachment of foodborne microorganisms to the processed food. In view of the above amendments and arguments, it is requested that this rejection be withdrawn.

Additionally, applicants wish to point out that the activity of a given antimicrobial agent against a particular microorganism cannot be inferred by its activity against other microorganisms, and this is especially true, when the effectiveness of a particular antimicrobial agent is evaluated on food surfaces. In view of the amendments to claim 1, it is requested that this rejection be withdrawn.

Applicants also note that Lattin does not disclose or render obvious the subject matter of new claims 32-34 that are limited to a method of preventing the growth of *Escherichia* on meat products. The method of Lattin would not have inherently prevented the growth of *Escherichia* on meat products.

3. Rejection under 35 U.S.C. § 103

Claims 12 and 14-26 are rejected as being obvious over Lattin because the examiner alleges that in regard to claim 12 , it would have been obvious to optimize the contact time, and in regard to claims 14-26, it would have been obvious to subject all food items known to be contaminated with microorganisms with a known disinfectant, such as quaternary ammonium compounds.

Applicants respectfully disagree with the examiner's basis for this rejection. Lattin discloses a method for removing or preventing *Salmonella* contamination of poultry and meat products by treatment with and effective amount of an aqueous solution of

quaternary ammonium compounds. However, it does not suggest that this treatment method would be effective on food products other than meat.

Food surfaces differ chemically and physically by virtue of their protein content, porosity, lipophilicity, surface pH, water permeability, surface area, and surface net electrical charge, and texture. In food sciences in general, all these chemical and physical differences or similarities among food surfaces have allowed the classification of different food products in different food groups, for example: meats, fruits and vegetables, fish, cereals, and milk and milk products. In particular, from a food microbiology standpoint, the differences between the various food groups are well established as shown by the Table of Contents of Fundamental Food Microbiology, Ray, 1996 (Appendix 2). This recognized classification makes it difficult to predict whether a given antimicrobial agent's success on one food group such as fresh meats would suggest success in another food group, such as seafood, fruits and vegetables.

A review of the food science literature supports the concept that members of different food groups behave differently when treated with antimicrobials. For example in a recent article in *J. Food Protection* 61(3):276-279, Mar. 1998, (Appendix 3), it was demonstrated that chlorine at 100 ppm was effective against *Salmonella enteritidis* contamination of eggs. While other reports show that chlorine has minimal antibacterial effects on beef even at 200 ppm, that is twice the concentration used in eggs. See HACCP: An Integrated Approach to Assuring the Microbiological Safety of Meat on Poultry, Sheridan, Buchanan, and Montville, 1996 (Appendix 4) and *J. Food Protection* 60(9): 1146-1151, Sep. 1997 (Appendix 5). The authors explained that this lack of efficacy was due to the chlorine becoming bound to proteins present in the large organic load associated with meat. This mechanism for the inactivation of chlorine was confirmed in another study in *J. Food Protection* 60(3): 276-282, Mar. 1997 (Appendix 6).

Differences between the various food groups ultimately are a consequence of the chemical nature of their surfaces. For example, meats have a large proteinaceous surface; while fruits and vegetables are composed of complex carbohydrates, such as pectin, cellulose, and hemicellulose, and other natural polymers such as lignin. Thus, the degree to which a chemical will be effective in treating a particular food group will ultimately depend on its effectiveness to remove bacteria from a food surface with a defined ratio of fatty, proteinaceous, carbohydrate, or connective tissues. Instances in the literature, showing that the efficacy of antibacterial chemicals is highly dependent on the type of tissue that was being treated, support the concept that different chemicals behave differently in the treatment of different food groups. For example in a recent report, *J. Food Protection* 61(5): 547-550, May 1998 (Appendix 7), it has been shown that hydrogen peroxide (3%) was found to be most efficient in removing bacteria present on connective tissue, rather than on fat tissue. In contrast, the antibacterial chlorhexidine (0.1%) was more effective on fat than on connective tissue.

From the microbiological point of view every food group has peculiarities in regard to their microbial load. For example in raw meats the spoilage is predominantly due to psychrotrophic aerobes and facultative anaerobes; while, in fruits, molds, yeast, and aciduric bacteria are the major concern. An extreme example of the specificity of a chemical against a microbial challenge, is the case of the use of $Na_2CaEDTA$. This chemical has been shown to extend the shelf life of codfish stored under carbon dioxide/nitrogen atmosphere, *J. Food Protection* 61(9): 1191-1194, Sep. 1998 (Appendix 8). However, this chemical it is ineffective to extend the shelf life of other food products or even codfish when it is stored in other conditions. In this particular example the reason for the extreme specificity is that $Na_2CaEDTA$ is only effective against *Photobacterium phosphoreum*, the microorganism responsible for the spoilage of codfish stored under carbon dioxide/nitrogen mixture conditions.

In the Office Action the examiner contends that because an agent has been known to be effective against a wide variety of organisms "... it would have been obvious to wash any food item with the reasonable expectation that microbial contamination would be removed, killed or prevented." The examples above support applicants' position that the success of treatment under certain conditions or of certain food types does not suggest to a skilled person that such treatment would be effective to treat any kind of foods.

Organic acids such as acetic, lactic or citric are well know to be effective against a wide variety of organisms. However, the acidity in apple cider was ineffective to remove, kill, or prevent the contamination of this food product by *E. coli* O157:H7 that has caused the deadly outbreaks of this organism in Washington State and in other places. See *J. Food Protection* 61(10):1372-1374, Oct. 1998 (Appendix 9).

Thus, these publications discussed above show that although a particular antimicrobial agent is effective against a wide variety of organisms, it would not be obvious to a skilled person that this agent would be effective on a different food.

Additionally, it is not only the composition but method of treatment that influences the effectiveness of a treatment. For example trisodium phosphate (TSP) has proven to be effective when used to remove bacterial contamination of beef as shown in *J. Food Protection* 60(8): 992-994, Aug. 1997 (Appendix 10) and *J. Food Protection* 60(6): 619-624, June, 1997 (Appendix 11), but is shown to be ineffective when used to prevent bacterial contamination on the same food product as shown in *J. Food Protection* 61(3): 300-306, March 1998 (Appendix 12).

Thus, these results support applicants' contention that in food science, it is necessary to actually perform the experiment rather than extrapolate results of one experiment to predict what will happen under another set of conditions or on another food group. For all of the foregoing reasons, Lattin does not render obvious the claims directed to the treatment of seafood, fruit and vegetables with QACs to prevent the growth of microorganisms

on these food products. It is requested that this rejection be withdrawn in view of these arguments and supporting documents.

4. Thomas *et al.* cited in the parent application

Applicants filed an Information Disclosure Statement in the parent application, U.S. Serial No. 08/631,578 disclosing a document, Thomas *et al.* ("Thomas"). Applicants herewith provide a copy for the examiner's convenience as Appendix 13. The examiner found the parent application allowable over the disclosure of Thomas. Thomas discloses treating chicken fascia from which the skin was carefully removed with CPC at $2gl^{-1}$ for 5 minutes, then contacting the fascia with *Salmonella*. The results showing only a small inhibition of bacterial attachment and the complexity of the procedure would fail to motivate a skilled person to use CPC to reduce or inhibit contamination of meat products other than poultry, seafood, vegetables and fruit products. The pending claims also are not anticipated or obvious over the disclosure of Thomas.

CONCLUSION

The present response is intended to be a complete response to the Examiner's Office Action and Advisory Action. It is believed that the above arguments and amendments to the claims place the application in condition for allowance, and a notice to that effect is respectfully requested. If there are any minor issues which can be taken care by telephone, it is requested that the Examiner contact the undersigned attorney at telephone number below.

Respectfully submitted,

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Date

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